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REMARKS

Claims 1-17 are currently pending in the subject application, and are presently under consideration. Claims 1-17 are rejected. Favorable reconsideration of the application is requested in view of the comments herein.

I. Rejection of Claims 1-5 and 12-13 Under 35 U.S.C. §103(a)

Claims 1-5 and 12-13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Publication No. 2002/0135866 to Sasaoka, et al. ("Sasaoka") in view of U.S. Patent No. 6,363,087 to Rice ("Rice"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 1 recites incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, and that light launched into an end of the fiber is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes. In the Office Action dated March 13, 2007 (hereinafter "Office Action"), the Examiner asserts that Sasoaka teaches this element of claim 1, and states that the fiber of Sasoaka would inherently allow higher Raman gain along the optical axis and promote lower order modes and discriminate against higher order modes due to being single mode. The Examiner relies on Rice to teach a multimode Raman amplifying fiber (Office Action, pages 4-5; citing Rice, Abstract), and also asserts that the fiber of Sasaoka would have identical properties as applicant's fiber after combination with Rice (Office Action, page 4; citing Sasaoka, paragraph 22). The Examiner further asserts that Sasaoka teaches that light launched into an end of the fiber is subject to higher Raman gain along the optical axis due to the doping profile of the fiber of Sasaoka (Office Action, page 4). Representative for Applicant respectfully disagrees with these assertions.

Sasaoka teaches that a core of the optical fiber is doped with GeO_2 to attain a refractive index higher than that of silica (Sasaoka, paragraph 22). Sasaoka also teaches that the fiber has a Raman gain coefficient of G_R/A_{eff} of 0.005 $(W*m)^{-1}$ (Sasaoka, paragraph 26). Thus, Sasaoka

PAGE 3/12 * RCVD AT 6/6/2007 2:25:22 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/10 * DNIS:2738300 * CSID:2166214072 * DURATION (mm-ss):04-14

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teaches that a desired Raman gain coefficient is obtained based on chromatic dispersion of each wavelength of the light and fiber effective area (see, *e.g.*, Sasaoka, paragraph 26). Therefore, Sasaoka does not teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 1. Instead, the teachings of Sasaoka are directed toward a uniform Raman gain coefficient as a function of wavelength and area. Specifically, if the fiber of Sasaoka had a radially dependent amount of dopant materials to provide a desired Raman gain coefficient profile, as recited in claim 1, the Raman gain coefficient of the fiber of Sasaoka would not be static as a function of area. As a result, Sasaoka cannot teach incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 1, as this would provide a non-uniform Raman gain coefficient profile.

In response to the assertion of inherency based on the fiber being single mode, Representative for Applicant respectfully submits that a single mode fiber is only capable of transmission of a single mode. As a result, the fiber of Sasaoka would not favor lower order modes and discriminate against higher order modes, as recited in claim 1, as the fiber of Sasaoka is capable of transmitting only a single mode. Even assuming *arguendo* that the Examiner relies on Rice to teach this element of claim 1, Representative for Applicant respectfully submits that the combination of Sasaoka and Rice does not teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 1. Rice does not teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile, as recited in claim 1. In addition, Sasaoka likewise does not teach this element of claim 1. As described above, Sasaoka teaches doping with GeO_2 to achieve a uniform Raman gain coefficient as a function of wavelength and area, and thus does not teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and

discriminates against higher order modes, as recited in claim 1. In addition, because the fiber of Sasaoka is single mode, Sasaoka likewise does not teach that light launched into an end of the fiber is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes, as also recited in claim 1.

The Examiner states that Sasaoka teaches incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile in the Response to Arguments section of the Office Action (Office Action, page 3). Even assuming *arguendo* that Sasaoka does teach this element, Representative for Applicant respectfully submits that Sasaoka does not teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile based on a teaching of incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile. The Present Application states "[t]he fiber core incorporates radially dependent amounts of various transparent oxides, which permits radially dependent control of the refractive index of the core material, such that a desired refractive index profile is obtained," (Present Application, page 5, ll. 21-23). However, the Present Application also states "[s]imultaneous incorporation of materials such as germanium oxide into the fiber core is used to produce a radially dependent Raman gain coefficient profile," (Present Application, page 6, ll. 3-5).

Therefore, the Present Application describes a distinction between two different dopants, such that there is no relationship between doping the core of the fiber to achieve a refractive index profile and doping the core of the fiber to achieve a Raman gain coefficient profile. As described above, neither Sasaoka nor Rice, individually or in combination teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 1. Therefore, assuming *arguendo* that Sasaoka teaches incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile, such a teaching has no relevance to incorporating radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile, as recited in claim 1. In addition, because Sasaoka does not teach incorporating radially dependent amounts of dopant materials to provide

a desired Raman gain coefficient profile, and because doping to achieve a desired refractive index profile and doping to achieve a desired Raman gain coefficient profile are unrelated, Sasaoka likewise does not teach that light launched into an end of the fiber is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes, as also recited in claim 1.

Accordingly, for all of these reasons, neither Sasaoka nor Rice, individually or in combination, teaches or suggests claim 1. Withdrawal of the rejection of claim 1, as well as claims 2-5, 12, and 13 which depend therefrom, is respectfully requested.

Claim 2 depends from claim 1, and thus should be allowed over the cited art for the same reasons as described above regarding claim 1. In addition, claim 2 recites incorporating radially dependent amounts of a dopant that affects the Raman gain coefficient, to provide a radially dependent Raman gain coefficient profile, and that the Raman gain coefficient has its highest value along the optical axis of the fiber. As described above regarding claim 1, Sasaoka and Rice, individually or in combination, does not teach incorporating radially dependent amounts of a dopant that affects the Raman gain coefficient, as recited in claim 2. The Examiner asserts that the Raman gain coefficient has its highest value along the optical axis of the fiber (Office Action, page 3; citing Sasaoka, FIG. 1B). Representative for Applicant respectfully disagrees. Sasaoka teaches a refractive index profile of the core and the first and second cladding of the optical fiber (Sasaoka, FIG. 1B; paragraph 23). However, FIG. 1B of Sasaoka is directed solely to a refractive index, and not to a Raman gain coefficient. For the reasons described above regarding claim 1, doping to achieve a desired refractive index profile and doping to achieve a desired Raman gain coefficient profile are unrelated concepts. In addition, as also described above, Sasaoka teaches a uniform gain as a function of wavelength and area, and thus cannot teach or suggest a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber, as recited in claim 2.

Furthermore, the language of claim 2 describes two separate dopants: radially dependent amounts of selected transparent oxides to provide radially dependent control of the refractive index, and radially dependent amounts of a dopant that affects the Raman gain coefficient to

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provide radially dependent Raman gain coefficient profile. The Examiner has failed to demonstrate two separate dopants in the teachings of Sasaoka and/or Rice, one for radially dependent control of the refractive index and one for radially dependent control of Raman gain coefficient profile. Therefore, Sasaoka and Rice, individually or in combination, do not or suggest incorporating radially dependent amounts of selected transparent oxides to provide radially dependent control of the refractive index, and radially dependent amounts of a dopant that affects the Raman gain coefficient to provide radially dependent Raman gain coefficient profile, as recited in claim 2. Accordingly, Sasaoka and Rice, individually or in combination, do not or suggest claim 2. Withdrawal of the rejection of claim 2, as well as claims 3-5 which depend therefrom, is respectfully requested.

Claim 4 depends from claim 2, and thus should be allowed over the cited art for the same reasons as described above regarding claim 2. In addition, as described above regarding claim 2, Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. Therefore, Sasaoka and Rice, individually or in combination, do not teach or suggest that the Raman gain coefficient profile has a generally parabolic shape with a peak coinciding with the optical axis of the fiber, as recited in claim 4. Withdrawal of the rejection of claim 4 is respectfully requested.

Claim 12 depends from claim 1, and thus should be allowed over the cited art for the same reasons as described above regarding claim 1. In addition, as described above regarding claim 1, Sasaoka teaches GeO_2 doping of the optical fiber core without any teaching as to non-uniformity of the amount of dopant material in the core of the optical fiber. Therefore, Sasaoka and Rice, individually or in combination, do not teach or suggest that the radially dependent amounts of dopant materials comprise a minimum amount of dopant material near an interface between the core and the cladding region with a gradual transition to a maximum amount at the optical axis, as recited in claim 12. Withdrawal of the rejection of claim 12 is respectfully requested.

Claim 13 depends from claim 1, and thus should be allowed over the cited art for the same reasons as described above regarding claim 1. As described above regarding claim 2,

Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. Therefore, Sasaoka and Rice, individually or in combination, do not teach or suggest that the fiber is configured to provide higher Raman gain along the optical axis for multimode light launched into the fiber, as recited in claim 13. Withdrawal of the rejection of claim 13 is respectfully requested.

II. Rejection of Claims 6-9, 11, and 14-17 Under 35 U.S.C. §103(a)

Claims 6-9, 11, and 14-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sasaoka and Rice in view of WO 02/50964 to Clarkson ("Clarkson"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 6 recites a fiber comprising a core having a longitudinal optical axis and incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes. Claim 6 also recites that light launched into the fiber is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes. As described above regarding claim 1, neither Sasaoka nor Rice, individually or in combination, teach or suggest incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, or that light launched into the fiber is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes, as recited in claim 6.

The addition of Clarkson does not cure the deficiencies of Sasaoka and/or Rice to teach or suggest claim 6. Clarkson teaches a fiber-based optical source with a high power laser diode stack pump source shaped into an intense beam by focusing and light concentrating elements (Clarkson, Abstract). However, the combination of Sasaoka and Clarkson does not teach or suggest a core having radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher

order modes, as recited in claim 6. Therefore, Sasaoka, Rice, and Clarkson, individually or in combination, do not teach or suggest claim 6. Withdrawal of the rejection of claim 6, as well as claims 7-10 which depend therefrom, is respectfully requested.

Claim 7 depends from claim 6, and thus should be allowed over the cited art for the same reasons as described above regarding claim 6. In addition, as described above regarding claim 2, Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. Therefore, neither Sasaoka nor Rice teach or suggest that the Raman gain coefficient profile has a generally parabolic shape with a peak coinciding with the optical axis of the fiber, as recited in claim 7. The addition of Clarkson does not cure the deficiencies of Sasaoka and/or Rice to teach or suggest claim 7. Accordingly, Sasaoka, Rice, and Clarkson, individually or in combination, do not teach or suggest claim 7. Withdrawal of the rejection of claim 7 is respectfully requested.

Claim 11 recites a method of generating a diffraction limited high brightness laser beam in a multimode fiber comprising providing a core with radially dependent amounts of at least one dopant that provides a Raman gain index profile with maxima coinciding with an optical axis of the fiber, and in the fiber, favoring the lowest order mode by providing maximum Raman gain along the optical axis, and discriminating against higher order modes. For substantially the same reasons as described above for claims 6 and 7, claim 11 should be allowed over the cited art. Withdrawal of the rejection of claim 11, as well as claims 16 and 17 which depend therefrom, is respectfully requested.

Claim 14 depends from claim 6, and thus should be allowed over the cited art for the same reasons as described above regarding claim 6. In addition, as described above regarding claim 1, Sasaoka teaches GeO_2 doping of the optical fiber core without any teaching as to non-uniformity of the amount of dopant material in the core of the optical fiber. Therefore, neither Sasaoka nor Rice teach or suggest that the radially dependent amounts of dopant materials comprise a minimum amount of dopant material near an interface between the core and the cladding region with a gradual transition to a maximum amount at the optical axis, as recited in claim 14. The addition of Clarkson does not cure the deficiencies of Sasaoka and/or Rice to

teach or suggest claim 14. Accordingly, Sasaoka, Rice, and Clarkson, individually or in combination, do not teach or suggest claim 14. Withdrawal of the rejection of claim 14 is respectfully requested.

Claim 15 depends from claim 6, and thus should be allowed over the cited art for the same reasons as described above regarding claim 6. In addition, as described above regarding claims 2 and 13, Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber and that the light that is pumped into the optical fiber is multimode light. Therefore, neither Sasaoka nor Rice teach or suggest that the fiber is configured to provide higher Raman gain along the optical axis for multimode light launched into the fiber, as recited in claim 15. The addition of Clarkson does not cure the deficiencies of Sasaoka and/or Rice to teach or suggest claim 15. Accordingly, Sasaoka, Rice, and Clarkson, individually or in combination, do not teach or suggest claim 15. Withdrawal of the rejection of claim 15 is respectfully requested.

Claim 16 depends from claim 11, and thus should be allowed over the cited art for the same reasons as described above regarding claim 11. In addition, as described above regarding claims 1 and 13, Sasaoka does not teach a multimode optical fiber and that the light that is pumped into the optical fiber is multimode light. Therefore, neither Sasaoka nor Rice teach or suggest that launching the pump power into one end of the multimode fiber comprises launching a multimode laser input into one end of the multimode fiber, as recited in claim 16. The addition of Clarkson does not cure the deficiencies of Sasaoka and/or Rice to teach or suggest claim 16. Accordingly, Sasaoka, Rice, and Clarkson, individually or in combination, do not teach or suggest claim 16. Withdrawal of the rejection of claim 16 is respectfully requested.

Claim 17 depends from claim 11, and thus should be allowed over the cited art for the same reasons as described above regarding claim 11. In addition, for substantially the same reasons as described above regarding claim 14, claim 17 should be patentable over the cited art. Withdrawal of the rejection of claim 17 is respectfully requested.

For the reasons described above, claims 6-9, 11, and 14-17 should be patentable over the cited art. Accordingly, withdrawal of this rejection is respectfully requested.

III. Rejection of Claim 10 Under 35 U.S.C. §103(a)

Claim 10 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Sasaoka, Rice and Clarkson in view of U.S. Publication No. 2003/0161361 to Paldus, et al. ("Paldus"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 10 depends from claim 6, and should be allowable for at least the reasons described above regarding claim 6. The addition of Paldus does not cure the deficiencies of Sasaoka, Rice, and Clarkson to teach claim 6. Paldus teaches a laser tuning mechanism that embodies spectrally dependent spatial filtering (Paldus, Abstract). However, the combination of Sasaoka, Rice, Clarkson, and Paldus, individually or in combination, does not teach or suggest a multimode fiber comprising a core having radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 6, from which claim 10 depends. Accordingly, claim 10 should be patentable over the cited art. Withdrawal of the rejection of claim 10 is respectfully requested.

CONCLUSION

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests reconsideration of this application and that the application be passed to issue.

Please charge any deficiency or credit any overpayment in the fees for this amendment to our Deposit Account No. 20-0090.

Respectfully submitted,

Date 6/6/07

Christopher P. Harris
Registration No. 43,660

CUSTOMER NO.: 26,294

TAROLLI, SUNDHEIM, COVELL, & TUMMINO L.L.P.
1300 EAST NINTH STREET, SUITE 1700
CLEVELAND, OHIO 44114
Phone: (216) 621-2234
Fax: (216) 621-4072